REMARKS

Claim 1 is pending herein. By the Office Action, claims 1-3 are rejected under 35 U.S.C. §103(a). By this Amendment, claim 1 is amended and claims 2 and 3 are canceled. Support for amended claim 1 can be found in the specification as filed, for example at page 27, lines 5-9 and page 31, lines 28-32. No new matter is added.

I. Rejection Under 35 U.S.C. §103

The Office Action rejects claims 1-3 under 35 U.S.C. §103(a) over Seto in view of Hirota. The Office Action argues that Seto discloses all of the elements of the claimed invention, except the limitation that the NO_x absorber also has a function of a particulate filter, but that such a teaching is provided by Hirota. Applicants respectfully traverse this rejection with respect to pending amended claim 1, claims 2 and 3 having been canceled.

The Office Action asserts that Seto discloses all of the features of the claimed invention except for the limitation that the NO_x absorbent can also function as a particulate filter. The Office Action argues, however, that a combined NO_x absorbent and particulate filter is conventional, as shown in Hirota. Applicants respectfully disagree.

A. The Claimed Invention

According to the claimed invention, a catalyst apparatus for purifying NO_x is located in the exhaust system upstream of the particulate filter. See claim 1. The catalyst apparatus can thus carry a large amount of catalyst absorbing NO_x to sufficiently absorb NO_x in the exhaust gas. When the air-fuel ratio in the catalyst apparatus is made rich, the absorbed NOx is released and can be purified by reduction. As a result, according to the claimed invention, the devices can sufficiently purify NO_x in the exhaust gas. Such devices are not disclosed in and would not have been obvious over a combination of Seto and Hirota.

A device for purifying the exhaust gas of an internal combustion engine according to the claimed invention, comprises a particulate filter arranged in the exhaust system, which is a wall-flow type and has a partition wall having pores, a catalytic apparatus for purifying NO_x

when the air-fuel ratio in the surrounding atmosphere thereof is lean and releasing the absorbed NO_x when said air-fuel ratio is stoichiometric or rich, and control means for making the air-fuel ratio in said catalytic apparatus rich to release NO_x from said catalyst of said catalytic apparatus to purify the released NO_x by reduction, and making the air-fuel ratio in the particulate filter rich to release NO_x from the catalyst of the particulate filter to purify the released NO_x by reduction so that the catalyst of the particulate filter also releases active-oxygen to oxidize and remove the particulates trapped on the particulate filter without producing luminous flame without further elevating the temperature of the trapped particulates to ignite and burn them.

The particulate wall of the particulate filter carries a catalyst for absorbing and reducing NO_x (claim 1). This material is located on the exhaust gas upstream side surface thereof, and thus an active-oxygen is released from the partition wall. Therefore, the particulates trapped on the partition wall can automatically be oxidized and removed by an active-oxygen released therefrom.

The partition wall has pores, and thus the particulate filter cannot carry a large amount of the catalyst for absorbing and reducing NO_x. Accordingly, even when the particulate filter carries its catalyst for absorbing and reducing NO_x, only a part of the NO_x in the exhaust gas can be purified. To sufficiently purify NO_x in the exhaust gas, a catalyst apparatus for purifying NO_x in which a partition wall has no pores and can carry a large amount of the catalyst for absorbing and reducing NO_x is required in the exhaust system.

According to the claimed invention, such a catalyst apparatus is arranged upstream of the particulate filter. Therefore, NO_x in the exhaust gas can be sufficiently purified. Additionally, when control means makes the air-fuel ratio in the catalytic apparatus rich to release NO_x from the catalyst of the catalytic apparatus to purify the released NO_x by reduction, the catalyst of the catalytic apparatus also releases an active-oxygen similarly with the catalyst carried on the particulate filter, and thus the active oxygen enters into the

particulate filter arranged downstream of the catalytic apparatus, and oxidizes the particulates trapped thereon without producing luminous flame. Therefore, the particulates trapped on the particulate filter can be easily oxidized and removed by the active-oxygen released from the particulate filter and by an active-oxygen released from the catalytic apparatus when the air-fuel ratio is made rich.

Such devices for purifying the exhaust gas of an internal combustion engine, as claimed, are nowhere taught or suggested by the cited references.

B. The References Do Not Teach or Suggest the Claimed Control Means

According to claim 1, the claimed device specifically includes a control means for making the air-fuel ratio in said catalytic apparatus rich to release NO_x from said catalyst of said catalytic apparatus to purify the released NO_x by reduction, and making the air-fuel ratio in the particulate filter rich to release NO_x from said catalyst of said particulate filter to purify the released NO_x by reduction so that said catalyst of said particulate filter also releases active-oxygen to oxidize and remove the particulates trapped on said particulate filter without producing luminous flame without further elevating the temperature of the trapped particulates to ignite and burn the trapped particulates. Such a control means is nowhere taught or suggested by the cited references.

According to the device for purifying the exhaust gas of an internal combustion engine described in claim 1, NOx in the exhaust gas can be sufficiently purified by the particulate filter and the catalytic apparatus that carries the catalyst absorbing NOx. Additionally, when the control means makes the air-fuel ratio in the catalytic apparatus rich to release NOx from the catalyst of the catalytic apparatus to purify the released NOx by reduction, the catalyst of the catalytic apparatus also releases active oxygen. As a result, the active oxygen enters into the particulate filter arranged downstream of the catalytic apparatus, and oxidizes the particulates trapped therein without producing luminous flame. Moreover, when the claimed control means makes the air-fuel ratio in the particulate filter rich to release

NOx from the catalyst of the particulate filter to purify the released NOx by reduction, the catalyst of the particulate filter also releases active oxygen. As a result, the active oxygen oxidizes and removes the particulates trapped on the particulate filter without producing luminous flame.

The oxidation and removal of particulates trapped on the particulate filter is carried out at a relatively low temperature and is different from burning of the particulate with the production of luminous flame after the temperature of the trapped particulates is elevated to their ignition temperature. Thus, in the oxidation of the particulates in the claimed device, after the air-fuel ratio in the particulate filter is made rich to release NOx and the released NOx is purified, it is not required for the temperature of the trapped particulates to be elevated to their ignition temperature.

In contrast to the claimed invention, Hirota teaches that when the air-fuel ratio is made rich to release NOx from the catalyst of the particulate filter and to purify the released NOx by reduction, the heating in the NOx releasing and reduction elevates the temperature of the trapped particulates so that the energy to ignite and burn the trapped particulates can be reduced. In particular, Hirota teaches that the trapped particulates must be burned with producing luminous flame, in order to be removed from the particulate filter. Thus, as described in Hirota at paragraph [0021], after the trapped particulates are heated by heat generated in the NOx releasing and reduction, the temperature of the trapped particulates is further elevated to their ignition temperature by a fuel supply or an electric heater.

Hirota does not teach or suggest that when the air-fuel ratio in the particulate filter is made rich, the catalyst absorbing NOx carried on the particulate filter releases an active oxygen. Thereafter, if the air-fuel ratio in the particulate filter is made rich to release NOx and purify the released NOx, the trapped particulates are oxidized and removed for a few minutes by the released active oxygen. Nevertheless, in the device of Hirota, after the air-

fuel ratio is made rich, the temperature of the trapped particulates is further elevated to their ignition temperature by a fuel supply and an electric heater.

In contrast, the claimed invention does not use a fuel supply and an electric heater to further elevate the temperature of the trapped particulates to their ignition temperature. Instead, the trapped particulates in the claimed device are oxidized and removed without producing luminous flame without further elevating the temperature of the trapped particulates to ignite and burn the trapped particulates.

Accordingly, it would not have been obvious to replace the downstream side catalytic apparatus of Seto with the particulate filter of Hirota, and to further modify the resultant combination to practice the claimed invention. Such a combination would still not include the control means of the claimed invention.

C. The References Do Not Disclose the Claimed Invention

Claim 1 specifically requires that the particulate filter be a wall-flow particulate filter comprising a partition wall having pores, and that the partition wall carries a catalyst on the exhaust gas upstream side surface thereof. Neither Seto nor Hirota teach or suggest the claimed particulate filter, where the catalytic apparatus is located upstream of the particulate filter, or the advantages that it provides.

Seto is asserted to disclose a catalytic apparatus (17). See Seto at Figs. 1 and 9 and the Abstract. According to Seto, the apparatus includes two NOx absorbents, denoted 17 and 20, where the NOx absorbent 17 is located upstream of the NOx absorbent 20. The downstream NOx absorbent 20 is provided to absorb NO_x released by the NOx absorbent 17. Seto at Abstract. However, that broad generic disclosure in Seto does not disclose, and does not teach or suggest, that the catalytic apparatus is or should be a wall-flow particulate filter comprising a partition wall having pores, where the partition wall carries a catalyst on the exhaust gas upstream side surface thereof. The cited disclosures of Seto do not teach or suggest that such a wall-flow particulate filter could or should be used in preference to any

other type of catalytic apparatus, or that such a wall-flow particulate filter would provide any advantages.

Additionally, Seto does not disclose particulars of the catalytic apparatus, and thus does not teach or suggest the specific location of the material on the exhaust gas upstream side surface of the particulate filter, as claimed. Hirota does not overcome these deficiencies of Seto.

Hirota is cited for the asserted disclosure that it is conventional in the art to use a catalyzed particulate filter that carries an NO_X absorber. The Office Action asserts that it would have been obvious to replace the NO_x absorbent of Seto with the particulate filter of Hirota to reduce harmful soot emission and save fuel. However, regardless of the disclosures of Hirota, any combination of Seto and Hirota would not have resulted in the claimed invention.

Even if one of ordinary skill in the art was motivated to substitute the particulate filter of Hirota for the NO_x absorbent of Seto -- an assumption Applicants deny -- the most logical modification of Seto would be to replace the first or upstream NO_x absorbent 17 of Seto, rather than the second or downstream NO_x absorbent 20 of Seto. If this modification was made, then the result would be the particulate filter located upstream of the catalytic apparatus, which is contrary to the claimed invention.

Furthermore, neither Seto nor Hirota provide any motivation to select one of the NO_x absorbent of Seto over the other for the asserted modification. Thus, neither Seto nor Hirota teaches or suggests that the downstream NO_x absorbent of Seto could or even should be replaced with the particulate filter of Hirota. Any such combination and modification is merely the improper use of hindsight based on the present disclosure, not motivation provided by the cited references.

Accordingly, any combination of Seto and Hirota would not provide the claimed invention. The combination would not provide an apparatus where the catalytic apparatus is

located upstream of the particulate filter, such that NO_x is sufficiently purified and particulates are easily oxidized and removed, as described above. Neither Seto nor Hirota, alone or in combination, teach or suggest an apparatus that provides these benefits of the claimed invention.

D. Conclusion

Accordingly, one of ordinary skill in the art would not have been motivated, based on the cited references, to practice the claimed invention. The claimed invention of claim 1 thus would not have been obvious over the cited references. Reconsideration and withdrawal of the rejection is respectfully requested.

II. Conclusion

For at least the reasons set forth above, Applicants respectfully submit that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the claim are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number set forth below.

Respectfully submitted,

James A. Oliff
Registration No. 27,075

Joel S. Armstrong
Registration No. 36,430

JAO:JSA

Date: October 11, 2005

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461